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ABSTRACT

Content analysis was performed on the top six core journals for 1990 in library and information science to determine the extent of research in the field. Articles (n=186) were examined for descriptive or inferential statistics and separately for the presence of mathematical models. Results show a marked (14%) increase in research for 1990, including a sharp rise in the use of descriptive statistics, and a slight decrease in the use of inferential statistics since 1985. While the highest inferential use was shown by "College and Research Libraries," the highest use of descriptive statistics, mathematical models, and overall research appeared in the "Journal of the American Society for Information Science" (JASIS). The conclusion is made that library and information science as a discipline continues to move rapidly forward in building a theoretical framework, with library science providing the empirical data to information science to develop theoretical models. (13 references) (8 tables/figures) (Author/DB)

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Quantitative Methods in Library and Information Science Literature: Descriptive vs. Inferential Statistics

A Master's Research Paper submitted to the
Kent State University School of Library Science
in partial fulfillment of the requirements
for the degree Master of Library Science

by
Barbara C. Brattin
May, 1991

IR053852

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This paper is dedicated to my children, Neil and Eric who have given me the courage to find my dreams.

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ABSTRACT

Content analysis was performed on the top six core journals for 1990 in Library and Information Science to determine the extent of research in the field. Articles (n=186) were examined for descriptive or inferential statistics and separately for the presence of mathematical models. Results show a marked (14%) increase in research for 1990, including a sharp rise in the use of descriptive statistics, and a slight decrease in the use of inferential statistics since 1985. While the highest inferential use was shown by College and Research Libraries, the highest use of descriptive statistics, mathematical models, and overall research appeared in JASIS. The conclusion is made that LIS as a discipline continues to move rapidly forward in building a theoretical framework, with Library Science providing the empirical data to Information Science to develop the theoretical models.

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I. INTRODUCTION

Much of the professional literature in the field of library and information science deals with the efforts of the profession to establish itself as a discipline with its own laws and principles. It is widely held that there is very little theoretical basis for librarianship. Library science research, as a source of theory, has not typically generated or tested hypotheses, but has primarily been concerned with practical application. Goldhor (1972,p. 142) sees this emphasis as self-defeating:

> If librarianship is ever to be a discipline with its own laws and principles, the derivation of those principles will have to rest in large part on the quantification of relevant observations and on the proper use of appropriate statistical methods.

Opposing views, such as those of Odi (1982) hold that library science is inherently a social science, and that the idea that the methods of the natural sciences are applicable to the study of social phenomena (human empiricism) is incorrect. Furthermore, he contends, the trend toward quantification of human behavior is alarming.

Kinnecun, et. al. (1987) found that while examples of well-conducted statistical tests and procedures were found in information science literature between 1982 and 1987, examples of misuse of statistics were also found. His conclusion: statistics alone do not give the research merit- the statistics must be used well.

The majority of the literature, however, supports empiricism as a reflection of the sophistication of the profession. This "status of research" is fully explored in McClure's work in which he advises that "if LIS is to progress as a discipline, it behooves the members of the profession to consider carefully the status of research " (McClure 1969, p.127).

In an effort to determine the advancement of library science toward a theoretical foundation, the major journals of the profession have been studied for trends in quantification, and more specifically for trends in the use of statistics. Kinnucan, et. al. (1987) make a distinction between quantitative methods and statistical methods. While statistical methods are empirical in nature (report observations in the real world), the mathematical model is quantitative in nature, dealing with the world of theory. Studies have treated the theoretical model in different ways. Most have discounted them as statistics. Empirical methods have traditionally been considered the basis of theory. If this is true, then the increase in the use of statistics, and particularly inferential statistics from 1967 to 1985 indicates a progression toward theory, yet the increase has not been overwhelming. In the latest study done, (Enger 1988) it was found that 68% of the articles under review contained no statistics at all. Ennis (1967, p. 899) may have been correct when he concluded that library research is "relentlessly oriented to immediate practice."

In an effort to continue the studies of Kim and Kim (1979), Nour (1985), Wallace (1985), and Enger (1988), this paper proposes to demonstrate that the incidence of statistics published in the core journals of Library and Information Science during the year 1990 continues the pattern of increase over the last completed study of 1985. By testing for mathematical models independent of other quantitative methods , the progress toward a theoretical foundation for librarianship by means of mathematical models is further explored. In addition, this research, in an attempt to define degree of specialization, has used quantitative methods to show which of the leading Library and Information Science journals publish the most statistics, overall and by category. The categorization of statistical methods by journal will attempt to show the degree of influence of Information Science as a co-discipline on the theoretical development of Library and Information Science as a whole. Furthermore, by analyzing the use of mathematical models within the literature, the trend toward quantification independent of statistics will be observed.

In order to compare this study's results with the Enger (1988) study, the same working definitions have been employed. The term "no statistics" has been used to describe articles that report on statistics already established or that contain no mathematical manipulation of data. "Descriptive statistics" identify those that are used to describe a measurable characteristic of a given situation. Descriptive statistics will

include frequencies, percentages, means, standard deviations, and correlation coefficients. "Inferential statistics" will refer to those that make inferences from the sample to the general population. Inferential statistics will include atleast chi-squares, T-tests, F-tests, and analysis of variance. This study proposes a separate category, that of the original mathematical model. The original mathematical model shall be defined as a bivariate or multivariate statement of relationships that attempts to describe a given system under all conditions. The category shall contain formal proofs of alogorithms or theoretical models for system behavior.

This study, for practical purposes, has been limited to examination of the 1990 issues of the six leading journals determined to be core to the field of library and information science , a list of which appears in Appendix A. Because of its limited scope, it cannot be directly compared to similar studies of greater sample size, but general trends may be determined. Smaller sample size is expected to yield higher inferential use due to the concentration of the journals dealing primarily with information science at the top of the Journal Citation Reports impact factor list.

II. REVIEW OF THE LITERATURE

The most longitudinal study of the use of statistics within the professional literature of Library and Information Science was done by Soon D. and M.T. Kim. They presented their findings in a paper entitled , "Academic Library Research: A Twenty Year Perspective," which they presented to the First National Conference of the Association of College and Research Libraries in November of 1978. For their study, Kim and Kim compared statistics published in articles of College and Research Libraries within two time spans: 1957-1966 and 1967-1976. College and Research Libraries was chosen as a representative journal because it tends to emphasize research in the academic setting, publishing articles that reflect that research. What Kim and Kim discovered was that between 1957 and 1966 only 15% of the articles published in College and Research Libraries used statistics, and of these, only 3% used inferential statistics. During the period 1967-1976, the number of quantitative studies rose to 43% of the total articles published within the journal, and the use of inferential statistics among that 43% rose to 24%. Because Kim and Kim focused purely on the leading research journal in Library and Information Science at that time, their results are not representative, showing higher values both for overall statistics and inferential statistics than would a broader survey of the literature. Their results, however, do show the increase in use of statistics within Library and Information

Science over the twenty year span.

L. Grotzinger used the same single-publication approach when he studied research methodologies used in Library Science dissertations. Grotzinger reported his findings in his paper "Methodology of Library Science Inquiry," published in 1981. For his study, Grotzinger chose dissertations presented during 1977 and 1978. Of the 76 doctoral studies examined, Grotzinger found 32 to be descriptive studies of the survey/interview type, and only 10 to be of experimental nature. Grotzinger continued his study with five library and information science journals which he considered to be research-oriented, each of which he examined from one to two years to "scrutinize the state of the art of librarianship's research " (Grotzinger, p.42). The Journal of the American Society for Information Science was determined to be the most sophisticated, publishing the highest number of inferential statistics.

The work of Bluma C. Peritz has been described as the "most comprehensive description to date of research methods in library research," (Nour, p.261) and is the basis against which all further studies have been compared. The Peritz study utilizes a bibliometric survey of 900 research papers published in the journals identified to be the core of the professional library and information science literature. The determination of "core" journals was done by a complex, objective system developed by Peritz involving Social Science Citation Index. Thirty-nine "core" journals were thus chosen for study for five selected

years within the time frame of 1950-1975. Peritz found that published research articles (which she defined as those reporting on "inquiry which is carried out... by a systematic method," and produces new facts or ideas) increased 55% from 1950 to 1965 and doubled from 1965 to
1975. Articles were then further studied for research methodologies, revealing a sharp increase in theoretical papers after 1965, and a rapid increase in Library and Information Science research overall.

Five years after the Peritz (1980) study came out, Martyvonne Nour (1985) published her study of the research articles published in core library and information science journals during the year 1980, providing a continuum with Peritz's work. For the sake of comparison with Peritz, Nour designed her research much like Peritz's, borrowing Peritz's definitions and design. Nour, however, repeated the determination of "core" journals for 1980, using a modified Peritz system for that determination in an effort to evaluate whether the "core" had remained the same or changed its membership since the 1975 study. From these, 41 journals were selected, and analysis was performed to determine what percentage of the articles could be classified as research, what methodologies were most frequently used, what subjects were most frequently treated, and the number of references to research cited by each. Nour's results showed the number of research articles to still be increasing, but the proportion of research articles to all articles to be decreasing

since 1975. Theoretical and analytical methods within the research were determined to have increased since 1975. Nour found the number of citations to research consistent with the findings of Peritz.

Since 1980, several similar studies have been performed, including Wallace (1985) who, by comparing the use of statistics in four disciplines- Education, Social Work, Library and Information Science, and Business, sought to determine which of the four was more "scientific." Only 6% of all the articles Wallace studied in 1981 used inferential statistics, and only 26% of all articles showed either descriptive or inferential statistics. Of the four disciplines, Library and Information Science showed the fewest inferential statistics.

The work of Kathy Enger, et al (1988) brings the literature up to date. By examining the 25 journals determined by Social Science Citation Index to be "core" journals in Library and Information Science, Enger determined the proportion of inferential to descriptive statistic use for the year 1985. By assigning the categories "no statistics", "descriptive statistics", or "inferential statistics" to each of the articles examined, Enger was able to show an overall pattern in publication trends. Only 1/3 of the articles Enger examined showed any kind of statistics at all, 21% of those showed descriptive statistics, and 11% showed inferential statistics. In order to explain her results, Enger took the study further by examining institutional affiliation of the authors themselves.

Academic librarians were found to publish the most number of articles while faculty members from other disciplines showed highest use of statistics. The highest use of inferential statistics was done by Library Science faculty.

Enger compared her results to those of Wallace (1985), Kim and Kim (1979) and Nour (1985), concluding that from 1981 to 1985 there was little increase in the publication of research in Library and Information Science, but that the use of statistics did increase, and the use of inferential statistics showed a marked increase.

III. METHODOLOGY and LIMITATIONS

In order to determine the core journals of 1990, this study utilized the last published issue of Journal Citation Reports (1988 edition), Information Science and Library Science category, published as part of Social Science Citation Index by the Institute for Scientific Information . This method was employed because it duplicated the method of Enger (1988) and her predecessors Wallace (1985) and Nour (1985), thereby justifying comparison to their sample. The top six journals determined to have the highest impact (number of citations to 1987 and 1988 articles divided by total number of articles published in same years by Library and Information Science journals) for 1988 were labeled "core journals." Use of 1987 and 1988 statistics

allowed one to make assumptions for 1989. These assumptions could not be avoided, because no Journal Citation Reports was publishedin 1989 and the 1990 edition was not available until six months after completion of this study. All six of the final journals selected were also part of the 25 core journals in Enger's 1985 study. The position of these journals, however, changed, as illustrated in Appendix B. Because Enger reviewed 25 core journals, and this study is limited to six, the results cannot be directly compared. Instead, the smaller sample size is expected to skew the results in favor of a higher inferential use. Core journals, as determined above, were further limited to those that publish original research, and those published in English. Furthermore, the journals were limited to ones that clearly related to Library and Information Science.

A journal article, for sake of comparison, carries the same working definition as that used by Enger (1988). It is therefore be defined as "any article appearing in the core journals, with exception of editorials, letters to the editor, news items, columns, book lists, bibliographies, book reviews, and obituaries." (Enger, p.40)

The six journals determined to be core to Library and Information Science for 1990 were examined issue by issue, article by article, using content analysis to determine the incidence of each category of statistics, and separately for incidence of mathematical models. "No statistics" was applied to any article in which there was no mathematical manipulation, or

within which only reprinted statistics to which no further mathematical manipulation had been performed were found. The category of "descriptive statistics" was assigned to any article containing frequencies, means, percentages, standard deviations, and correlation coefficients. The category "inferential statistics" was applied to any article which used chi-square, t-tests, F-tests, analysis of variance, or regression. Original mathematical models included formal proofs of alogorithms and theoretical models for system behavior. To be counted in the latter category, the article must have proposed an original model within the text. In those cases where proof or test of an existing model was described, the article did not merit inclusion in the mathematical category. Mathematical models were counted independently of the search for statistical methods and did not alter the statistical findings in any way. In addition, where there was use of both descriptive and inferential statistics within the same article, the article was counted in the inferential category only. Therefore, only one category was assigned for each article examined. In the case where a statistical method was used that did not fall into the category of either desriptive or inferential statistics, the article was assigned to the "no statistics" category.

The overall percentage of articles for all journals cited that fell within each of the three categories "no statistics," "descriptive statistics," and "inferential statistics" are represented by percentages and frequencies. Secondly, the data

have been categorized by journal in an attempt to show what type of statistic is used most frequently in each of the journals. From the results, one can infer which of the journals are more mathematically oriented or scientific vs. which journals are more suited for the philosopher, historian, or general reader. In addition, such manipulation of the data has allowed for direct comparison with the authors of single-journal studies such as Kim and Kim (1979) and Grotzinger (1981). By singling out mathematical models from all other research methods, an attempt has been made to show at what stage of theory development the LIS profession is currently working.

Several Limitations became evident while conducting this study. First, selection of the core journals for 1990 was severely hampered by the fact that no Journal Citations Report was published for 1989. From Appendix B it is evident that the impact factors change considerably in a short time. While this may not have become a factor in a larger population size, it is apparent that selection of different journals for such a small study would have changed the results significantly. Because, however, two-thirds of the journals selected were also in the top ten choices for 1985, we can remain reasonably comfortable with our choices. Sample size itself was small due to time limitations. A larger sample size would have allowed for better generalizations about the characteristics of LIS journal articles as a whole. It is important to emphasize that the inclusion of statistics is not the sole indicator of research content.

Journals such as Library Quarterly, which is noted for publishing historical research, are underrepresented in a study that seeks statistics as the sole measure of research. The methodology used in this study is not meant to imply that statistics are the sole criteria for inclusion in "research," rather this study attempts to study the particular facet of research that does employ statistical measures. Therefore the term "research" has for our purposes been used to refer only to articles in which statistics are presented. High results for statistics do in no way imply the quality of journals or the articles they publish. Our purpose was to seek to discover any trends in statistics or quantification within the LIS literature.

lV. DATA

Results of overall statistics are shown in Table 1. Of the 186 articles studied, 85 (46%) were determined to be statistically oriented. Of these statistical articles, 68 (37% of all articles or 80% of all research articles) were determined to have used descriptive statistics. Another 17 (9% of all articles, or 20% of all research) were determined to have used inferential statistics. Fifteen percent of all articles examined used mathematical models, a figure nearly twice as high as inferential use.

Data were analyzed to determine the leading journal contributors to statistical research and statistical types. Results are shown in Table 2. Of the 186 journal articles

examined , the majority (n=36 or 42%) of research came from JASIS. Second in statistical research was CRL (26% or n=22) with LQ at the bottom for statisticaly-oriented research contributions. JASIS again led the way in descriptive statistics, publishing 43% (n=29) of all the descriptive statistics for 1990. CRL was second again, publishing 19% (n=13) of descriptive statistics. LQ showed the least descriptive statistics. In the inferential category, CRL came out on top, publishing 53% (n=9) of the study's inferential statistics. JASIS came in a close second, showing 41% (n=7) of the year's total. Online Review, Serials Librarian, and Library Quarterly published no inferential statistics for 1990. In the independent category "mathematical models," only two journals showed entries. JASIS came out on top, publishing 24 original mathematical models for a total of 86% of this population. Journal of Documentation published four articles of this type for 1990, accounting for 14% of published mathematical models. These results are shown graphically in figures 2-5.

Journals were next analyzed individually. Results are shown in Table 3. JASIS appeared to be the most mathematically sophisticated of the 1990 LIS journals, with 71% of its 51 journal articles in the statistically-oriented research category. In addition, 57% of the JASIS articles showed descriptive statistics and 14% used inferential statistics. Of all the articles in JASIS for 1990, 47% were original mathematical models.

Close behind in statistical research content came CRL, showing 50% of its 44 articles to present statistics. Additionally, 30% of all CRL articles in 1990 showed descriptive statistics, and 20% used inferential statistics. No mathematical models were found in CRL for 1990.

Online Review, with a total of only 20 articles published in 1990, came in third for statistical research content, showing 45% of its articles to contain statistics. All of the research in Online Review utilized descriptive statistics.

Journal of Documentation published 18 articles in 1990. Seven of those were considered to be statistical research (39%). Six articles used descriptive statistics(33%) and one showed inferential statistics (6%). Journal of Documentation was the only journal of those studied other than JASIS to publish original mathematical models in 1990. These four models comprised 22% of the total articles published.

Library Quarterly published even fewer articles than Online Review- a mere 13 for 1990. Of these five, or 38% were reported statistical research, and all research used descriptive statistics.

Serials Librarian published the third highest number of articles in 1990 (40), yet only 15% of these were reports of statistical research; all of these showed descriptive statistics. Serials Librarian published no inferential statistics and no mathematical models for 1990.

V. DISCUSSION

Wyllys (1978) stated the use of statistics in the literature of a discipline, particularly the use of inferential statistics , indicates to what extent the discipline is scientifically oriented. There has been much debate over whether Library and Information Science ought to be taking a "human empiricism" approach to research (see Odi, 1982). Library science, as a service profession, has, nevertheless, attempted to quantify human experience, as is evidenced by the abundance of statistical use in the literature. The steady increase of inferential statistics in the LIS literature over the past thirty years shows a marked attempt at quantification within the profession- but are we aiming at an impossible, however desirable task? Further, are we equating the term quantitative with the term qualitative?

When Kim and Kim (1979) studied College and Research Libraries between 1967 and 1976 they found 43% of the articles to be statistically-oriented research. In 1990 the number rose to 50%. During the same time frame Kim and Kim found CRL to use inferential statistics in 24% of its research. In 1990, 41% of the research articles in CRL showed inferential statistics, an increase of 17% in 14 years. The rise in statistical research and inferential statistics, therefore, has been significant within this journal over the past fourteen years, but the major increase in statistical method for CRL is of the descriptive nature. This

trend might well be explained by an increasing emphasis on publication for academic librarians as a profession. Grotzinger (1981) examined CRL from 1977 to 1979, concluding that more than 40% of research articles within it utilized descriptive statistics. Our results for 1990 found 59% of the statistical research in CRL to be of the descriptive type, a significant increase over the 1981 study. Grotzinger concluded from his studies that JASIS was the most "sophisticated" journal in the LIS field, publishing the most research and inferential statistics. Because sophistication cannot solely be measured by statistical presentation, we prefer in 1990 to say that JASIS appears to be the most mathematically sophisticaed of the LIS journals of 1990, with 36% of its articles displaying statistical methods and 86% showing mathematical models.

Enger (1988) concluded that past studies have shown that smaller sample size and the study of research journals as a group yielded higher inferential use. This study does not fit that model. When Enger studied inferential use in the 25 core journals of 1985, she found 11% of the research to show inferential use. In 1990, that proportion dropped to 9% even though the sample size was reduced to six and included the top three research journals in the field. This variance might be explained several ways. First, the 1990 statistics do show a jump in statistical research, which is wholly attributable to descriptive statistics. This jump could be the result of two combined factors: increasing pressure to publish among academic librarians and the lack of

stastistical education in library graduate programs. Grotzinger (1981) discusses this in the results of his studies of the journals of library and information science. It occurred to him during his study that librarians, in order to understand JASIS, would have to have a basic understanding of inferential statistics. He sees this need as a "strong case for the requirement of instruction about statistics in the curricula of graduate library education programs (Grotzinger, p. 44).

There is a second possible reason why there seems to be a drop in inferential statistics for 1990. This reason cannot be statistically supported in the literature, however, it merits attention. It is the role of the theoretical (mathematical) model in LIS research. It is inherently logical that in order to develop a theoretical base, a discipline must first seek empirical data, often of the descriptive nature. This we have seen to be the trend over the past thirty years in LIS research. As the profession matures it begins to use this empirical data to develop hypotheses that can be tested, often by use of inferential statistics. This "codifying" of concepts and the presentation of mathematical models to explain user and system behavior is a stage of theoretical development that occupied 47% of the articles published in JASIS for 1990,and 22% of JD articles, the top two information science journals. In addition, mathematical models accounted for 15% of all articles within the core journals of 1990, a figure 66% higher than the percentage for inferential use. It appears, then, that the field of

information science is at a stage in research apart from the traditional library science journals. Information science appears to be leading the way toward a theoretical framework for LIS as a whole, while the traditional Library Science journals continue to provide the empirical data with which to build the theory, and the philosophical basis for the profession.

VI. CONCLUSION

Brooks (1989) discussed the abundance of theoretical models in librarianship and information science. From the data presented here, his observations are verified. There is indeed a proliferation of modelling within the field. Brooks contends, however, that the empirical testing of these theoretical models is not as frequently done as would occur in a scientific discipline. This is again verified by our low results for inferential statistics. Brooks calls for the discipline of information science to "codify concepts" and "agree on units of measurement" (Brooks, p. 248). The resultant "science of information" based on scientific models, he contends, will be available to the librarian to solve problems empirically. From our results in the mathematical model category, we see the effort to codify concepts has been a major effort for the journals of information science in 1990. The fact that the incidence of mathematical models is at a level nearly twice as high as that for inferential statistics leads us to believe that LIS as a discipline is yet in the formative stage of developing a

theoretical framework for the discipline. The increasing research performed over the past twenty years has enabled information scientists to hypothesize about the laws governing system and user behavior. It appears this new stage of theory development has been entered and JASIS and Journal of Docmentation as the core journals of Information Science are leaders in this movement.

VII. SUGGESTIONS FOR FUTURE STUDY

In order to follow the development of LIS theory it is suggested that a study of this type be done periodically every 5-10 years. The inclusion of mathematical models, independent of any other form of quantification is suggested to determine any trends therein. Future studies are encouraged to be of a more comprehensive nature, utilizing a larger sample than the one done here in order to better generalize about the characteristics of the LIS literature as a whole. Additionally, it is suggested that an alternative method be devised for determining the core jounals in LIS for a particular year. While use of Social Sciences Citation Index is an effective means for this task, the publication of Journal Citations Reports has not been proven to be reliable.

TABLE 1

PERCENT ARTICLES SHOWING STATISTICS OR MODELS

	N	(%)
PERCENT RESEARCH	85	(46)
PERCENT DESCRIPTIVE OVERALL	66	(37)
PERCENT INFERENTIAL OVERALL	17	(9)
PERCENT MATHEMATICAL MODEL OVERALL	28	(15)
PERCENT OF RESEARCH DESCRIPTIVE	66	(80)
PERCENT OF RESEARCH INFERENTIAL	17	(20)
NON-RESEARCH ARTICLES	101	(54)
TOTAL NUMBER OF ARTICLES	186	(100)

Table 2.

USE OF STATISTICS AND MODELS BY JOURNAL

Journal	Research n (%)	Descriptive n (%)	Inferential n(%)	Models n (%)
JASIS	36 (42%)	29 (43%)	7 (41%)	24 (86%)
LQ	5 (6%)	5 (7%)	0	0
JD	7 (8%)	6 (9%)	1 (6%)	4 (14%)
OR	9 (11%)	9 (13%)	0	0
CRL	22 (26%)	13 (19%)	9 (53%)	0
SL	6 (7%)	6 (9%)	0	0
Totals	85	68	17	28

TABLE 3

PERCENT OF RESEARCH ARTICLES WITHIN EACH JOURNAL

Journal	Research n(%)	Descriptive n(%)	Inferential n(%)	Models n(%)
JASIS (n=51)	36 (71)	29 (57)	7 (14)	24 (47)
CRL (n=44)	22 (50)	13 (30)	9 (20)	0
OR (n=20)	9 (45)	9 (45)	0	0
JD (n=18)	7 (39)	6 (33)	1 (6)	4 (22)
LQ (n=13)	5 (38)	5 (38)	0	0
SL (n=40)	6 (15)	6 (15)	0	0
Total (n=186)	85 (46%)	68 (36%)	17 (9%)	28 (15%)

Figure 1
Contribution to Total Statistics

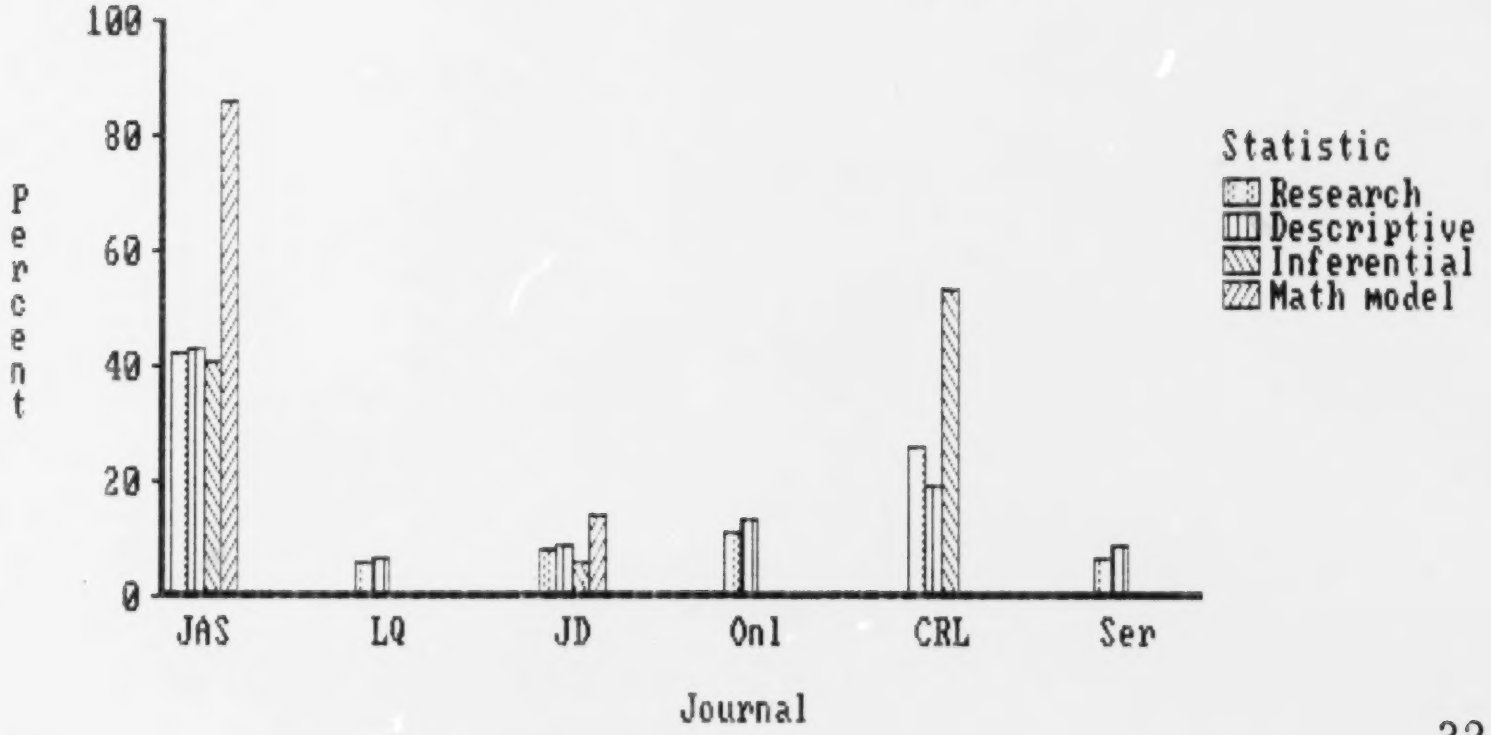
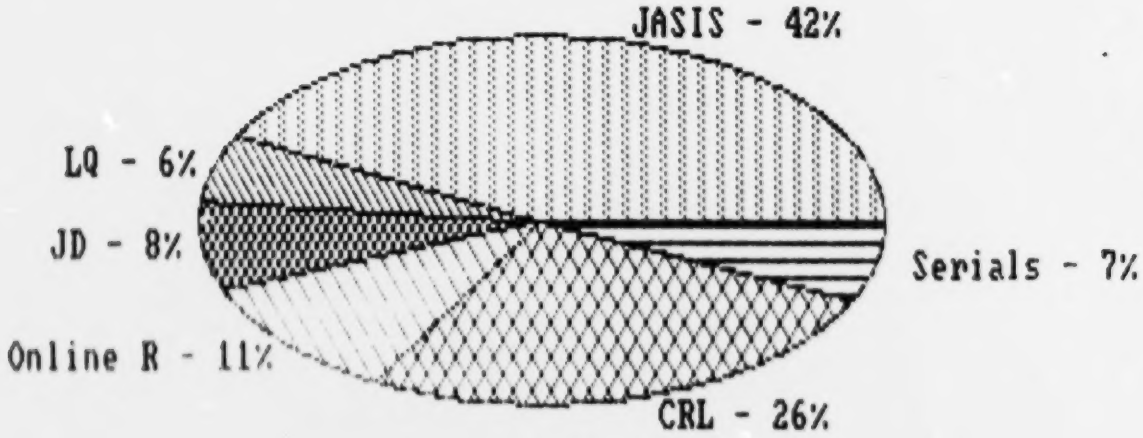


FIGURE 2
PERCENT RESEARCH ARTICLES EACH JOURNAL

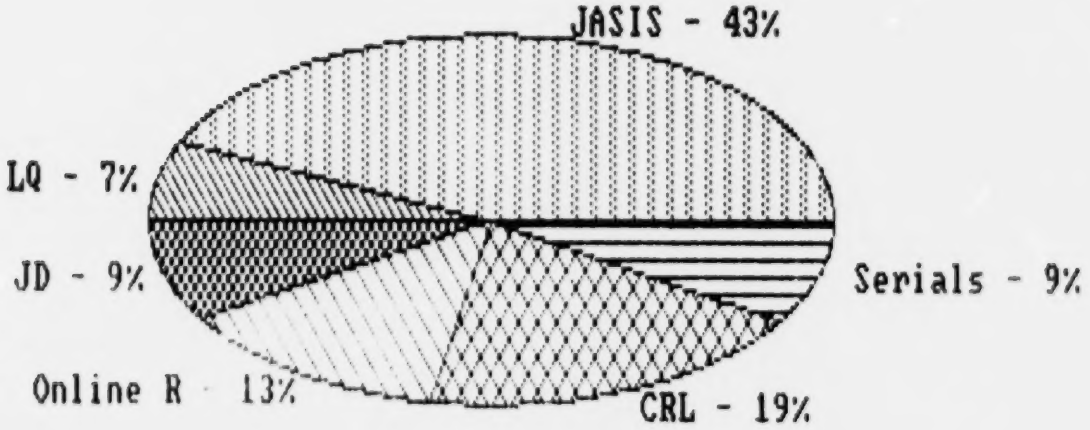


PERCENT - Research

33

34

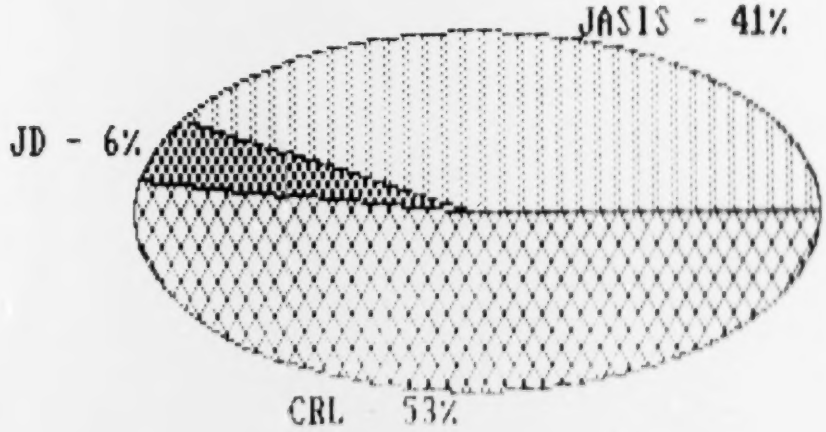
FIGURE 3
PERCENT DESCRIPTIVE STATISTICS BY TITLE



35

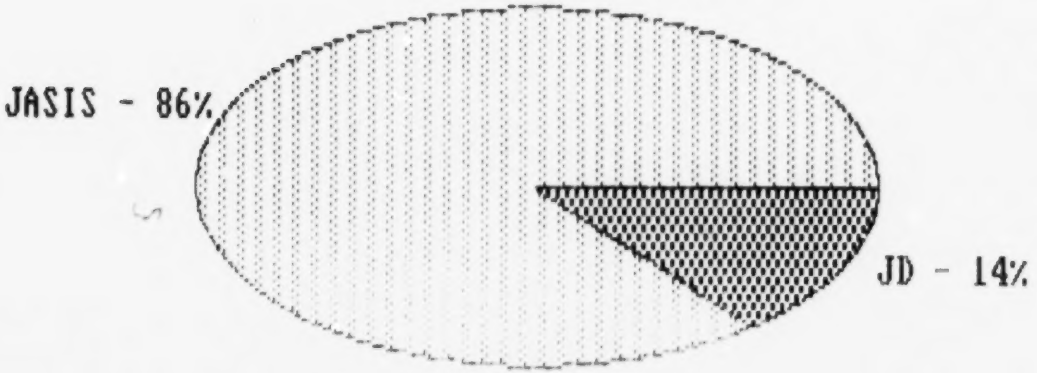
36

FIGURE 4
PERCENT INFERENTIAL STATISTICS BY TITLE



PERCENT - Inferential

FIGURE 5
PERCENT MATHEMATICAL MODELS BY TITLE



PERCENT - Math model

Appendix A

Core Journals in Library and Information Science for 1990

Journal	Impact Factor
1. Journal of the American Society for Information Science (JASIS)	1.444
2. Journal of Documentation	1.161
3. College and Research Libraries	1.156
4. Online Review	1.133
5. Serials Librarian	1.068
6. Library Quarterly	1.000

Appendix B

Journal	Rank in 1985	Rank in 1988
JASIS	3	1
Journal Doc.	9	2
CRL	4	3
Online Rev.	5	4
Serials Lib.	13	5
LQ	25	6

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